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Latzina et al.

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(54) **DATA ITEM REFERENCE FOR A QUERY DEFINITION**

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(52) **U.S. Cl.**
CPC .. ***G06F 17/30477*** (2013.01); ***G06F 17/30312*** (2013.01); ***G06F 17/30398*** (2013.01)

(58) **Field of Classification Search**
CPC G06F 17/30477; G06F 17/30312; G06F 17/30398
USPC 707/765
See application file for complete search history.

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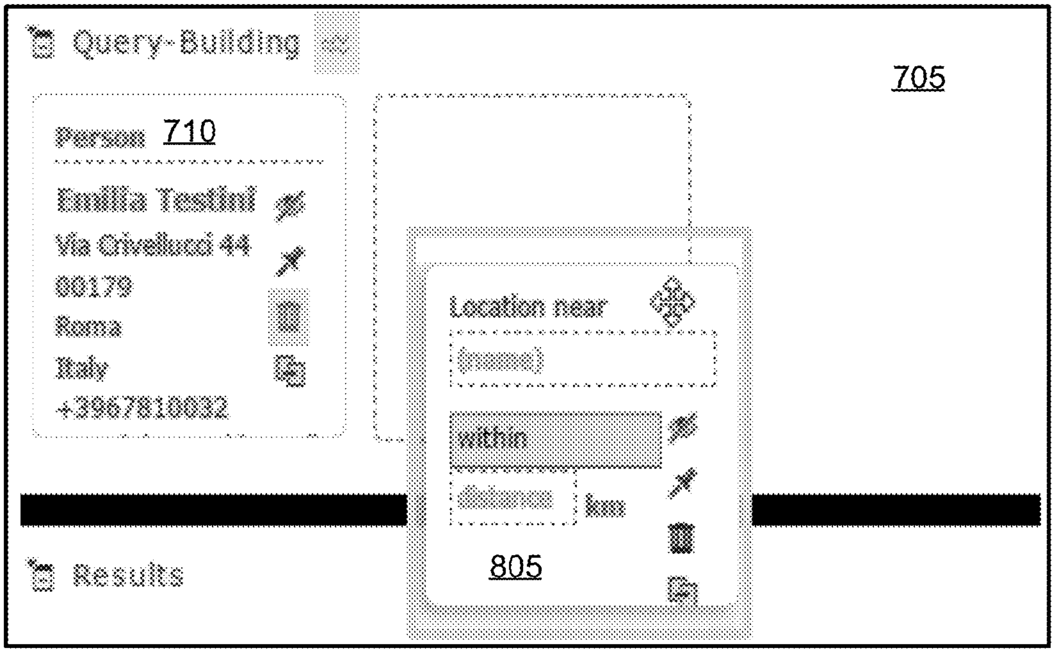
(57) **ABSTRACT**

A method, user interface, and computer-readable medium to receive a representation of a first query item, the first query item belonging to a data set and having at least one attribute; receive a representation of a second query item, the second query item being defined as relating to at least one particular attribute of another query item; associate the second query item with the first query item; automatically retrieve, in response to the second query item being associated with the first query item, a value for the at least one particular attribute of the second query item from the first query item; and save a record of the retrieved value.

19 Claims, 10 Drawing Sheets



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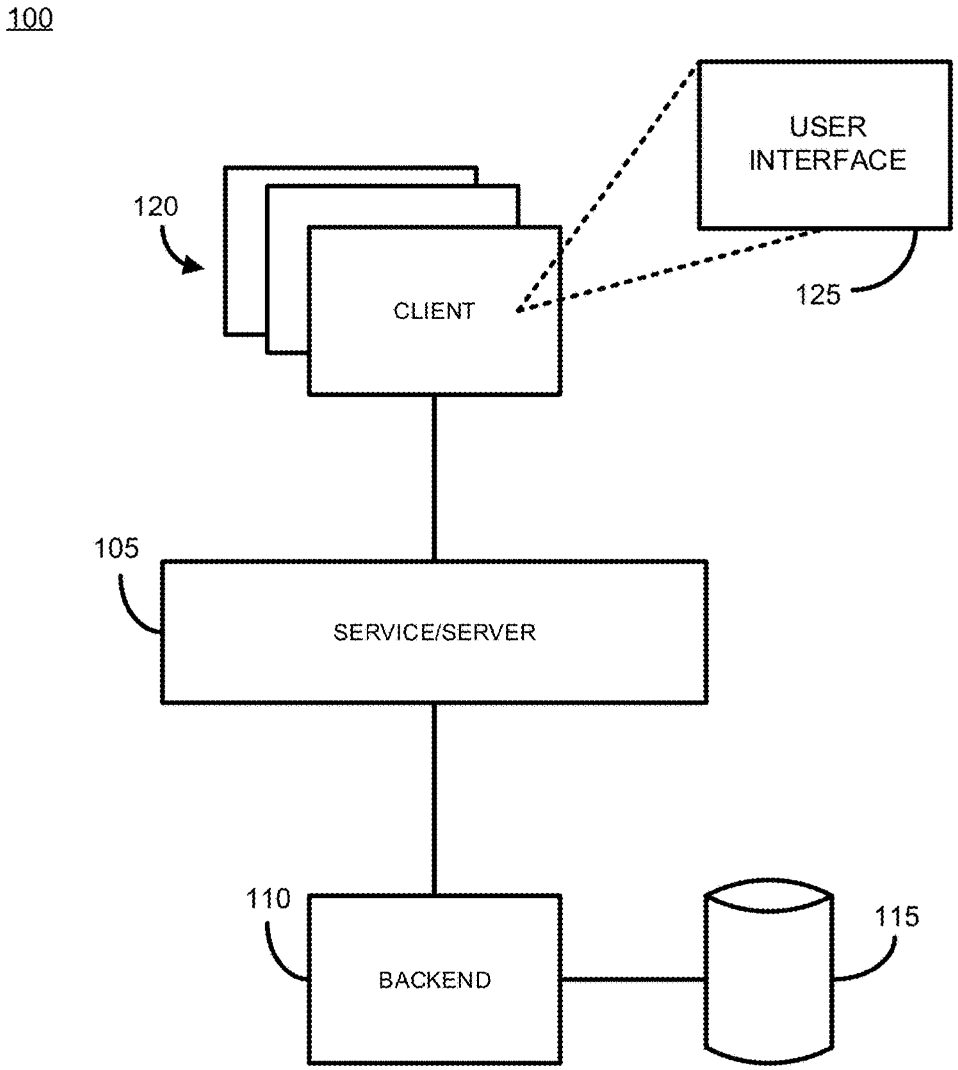
100
120
CLIENT
USER
INTERFACE
125
105
SERVICE/SERVER
110
BACKEND
115

FIG. 1

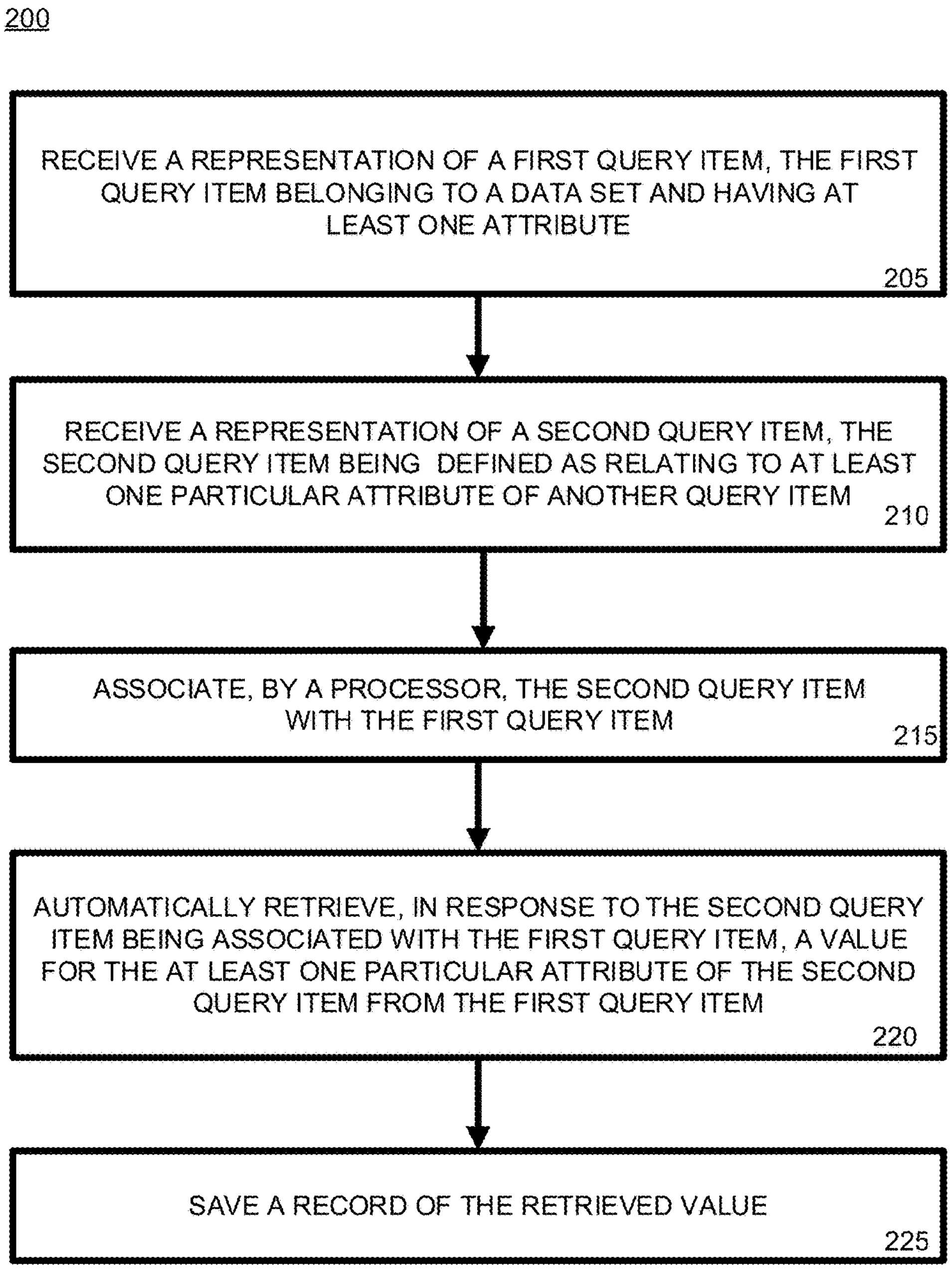
200
RECEIVE A REPRESENTATION OF A FIRST QUERY ITEM, THE FIRST QUERY ITEM BELONGING TO A DATA SET AND HAVING AT LEAST ONE ATTRIBUTE
205
RECEIVE A REPRESENTATION OF A SECOND QUERY ITEM, THE SECOND QUERY ITEM BEING DEFINED AS RELATING TO AT LEAST ONE PARTICULAR ATTRIBUTE OF ANOTHER QUERY ITEM
210
ASSOCIATE, BY A PROCESSOR, THE SECOND QUERY ITEM WITH THE FIRST QUERY ITEM
215
AUTOMATICALLY RETRIEVE, IN RESPONSE TO THE SECOND QUERY ITEM BEING ASSOCIATED WITH THE FIRST QUERY ITEM, A VALUE FOR THE AT LEAST ONE PARTICULAR ATTRIBUTE OF THE SECOND QUERY ITEM FROM THE FIRST QUERY ITEM
220
SAVE A RECORD OF THE RETRIEVED VALUE
225

FIG. 2

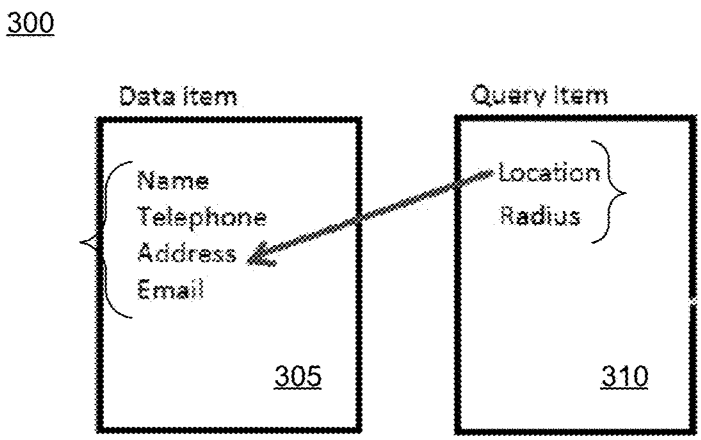
300
Data item
Name
Telephone
Address
Email
305
Query Item
Location
Radius
310

FIG. 3

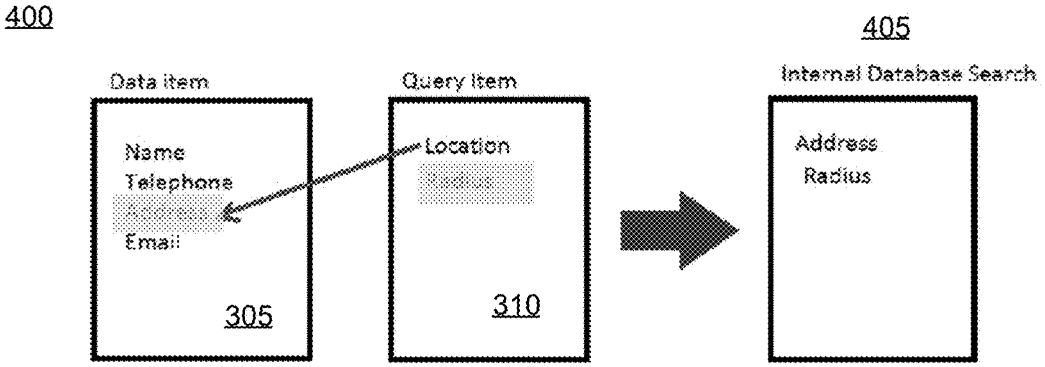
400
Data item
Name
Telephone
Address
Email
305
Query Item
Location
Radius
310
405
Internal Database Search
Address
Radius

FIG. 4

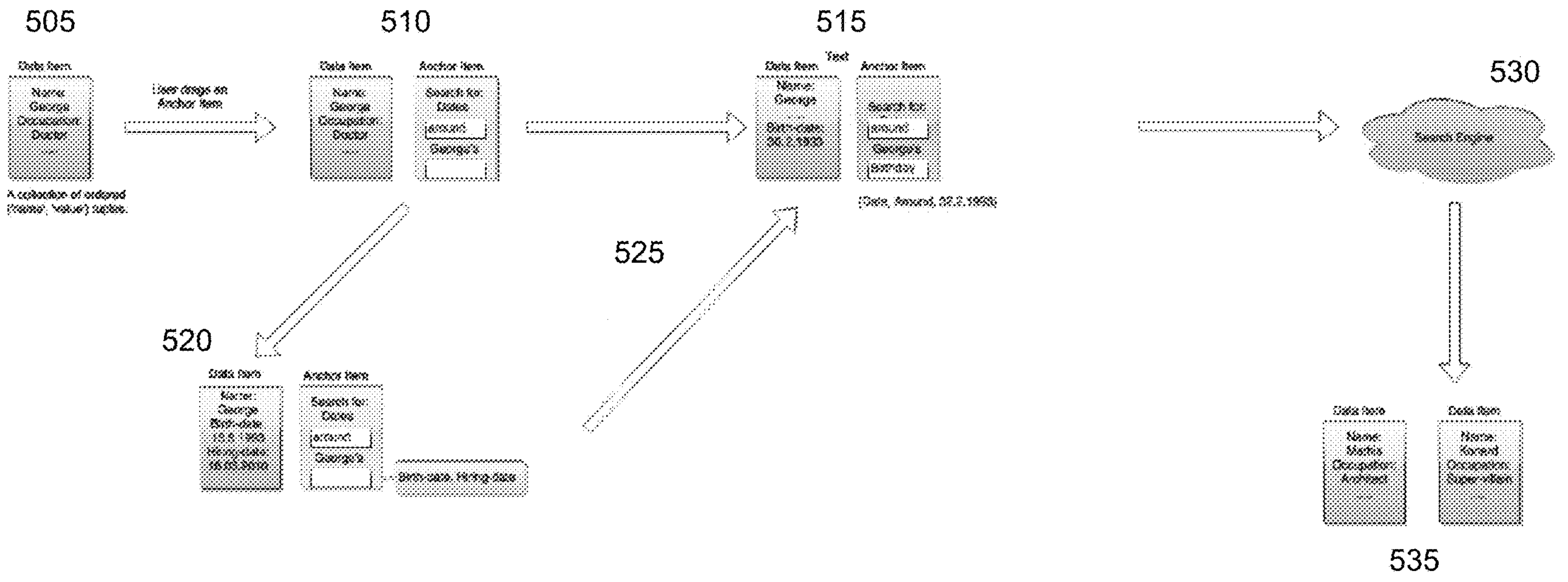
505
Data Item
Name:
George
Occupation:
Doctor
...
A collection of ordered
(name, value) tuples.
User drags an
Anchor Item
510
Data Item
Name:
George
Occupation:
Doctor
...
Anchor Item
Search for:
Dates
around
George's
515
Text
Data Item
Name:
George
Birth-date:
22.2.1959
Anchor Item
Search for:
around
George's
birthday
(Date, Around, 22.2.1959)
520
Data Item
Name:
George
Birth-date:
[illegible]
Hiring-date:
[illegible]
Anchor Item
Search for:
Dates
around
George's
Birth-date, Hiring-date
525
530
Search Engine
Data Item
Name:
Martha
Occupation:
Architect
Data Item
Name:
Konrad
Occupation:
Super-villain
535

FIG. 5

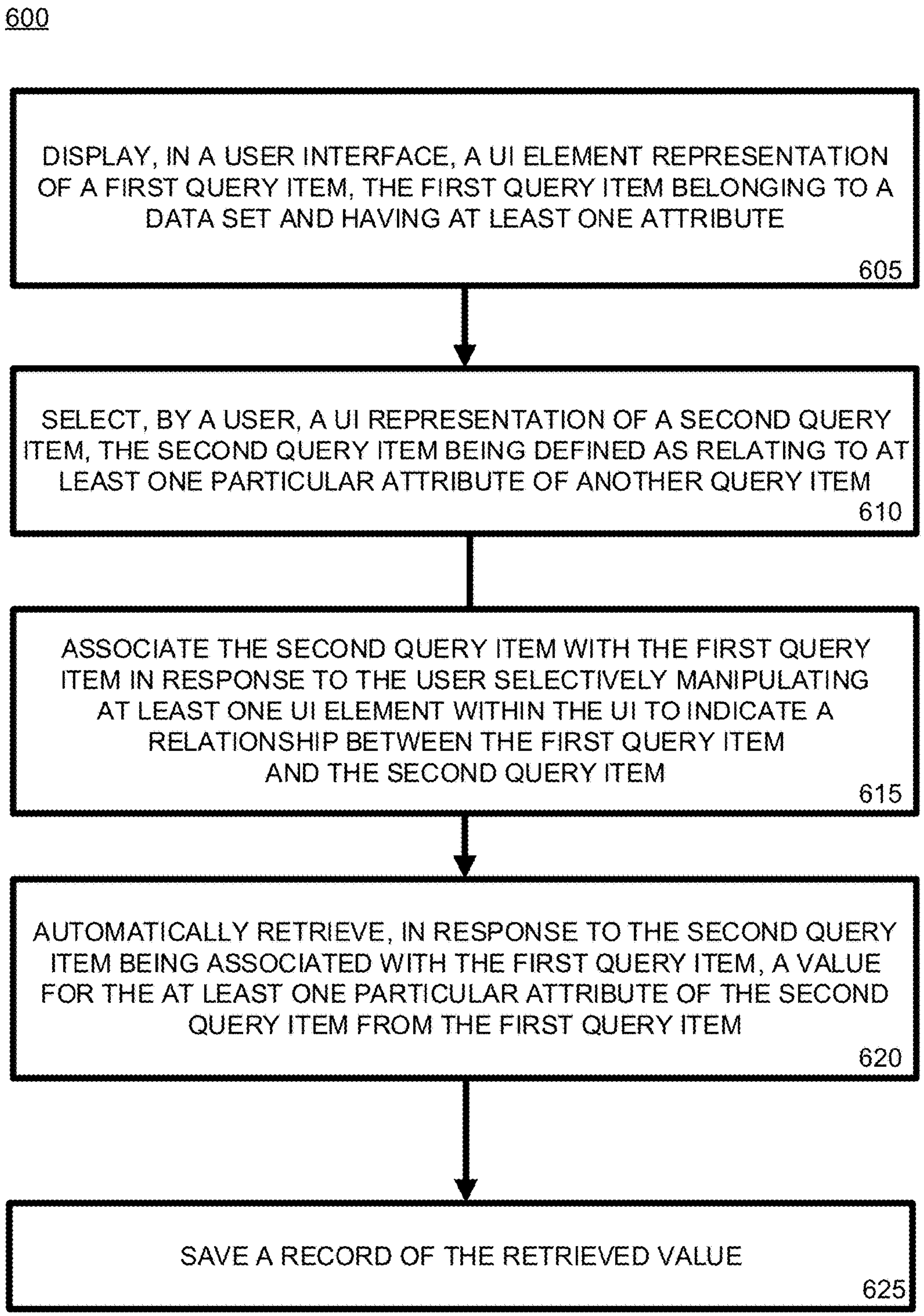
600
DISPLAY, IN A USER INTERFACE, A UI ELEMENT REPRESENTATION OF A FIRST QUERY ITEM, THE FIRST QUERY ITEM BELONGING TO A DATA SET AND HAVING AT LEAST ONE ATTRIBUTE
605
SELECT, BY A USER, A UI REPRESENTATION OF A SECOND QUERY ITEM, THE SECOND QUERY ITEM BEING DEFINED AS RELATING TO AT LEAST ONE PARTICULAR ATTRIBUTE OF ANOTHER QUERY ITEM
610
ASSOCIATE THE SECOND QUERY ITEM WITH THE FIRST QUERY ITEM IN RESPONSE TO THE USER SELECTIVELY MANIPULATING AT LEAST ONE UI ELEMENT WITHIN THE UI TO INDICATE A RELATIONSHIP BETWEEN THE FIRST QUERY ITEM AND THE SECOND QUERY ITEM
615
AUTOMATICALLY RETRIEVE, IN RESPONSE TO THE SECOND QUERY ITEM BEING ASSOCIATED WITH THE FIRST QUERY ITEM, A VALUE FOR THE AT LEAST ONE PARTICULAR ATTRIBUTE OF THE SECOND QUERY ITEM FROM THE FIRST QUERY ITEM
620
SAVE A RECORD OF THE RETRIEVED VALUE
625

FIG. 6

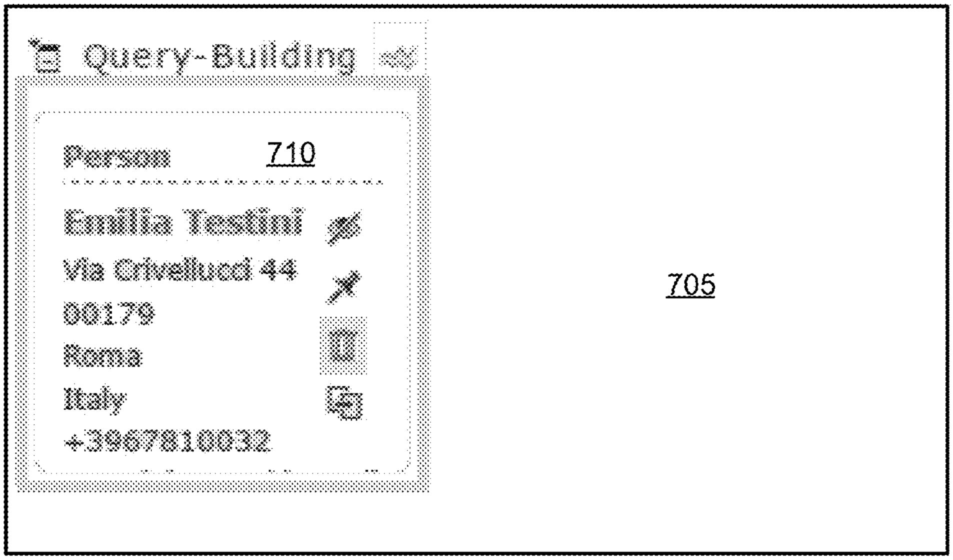

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FIG. 7

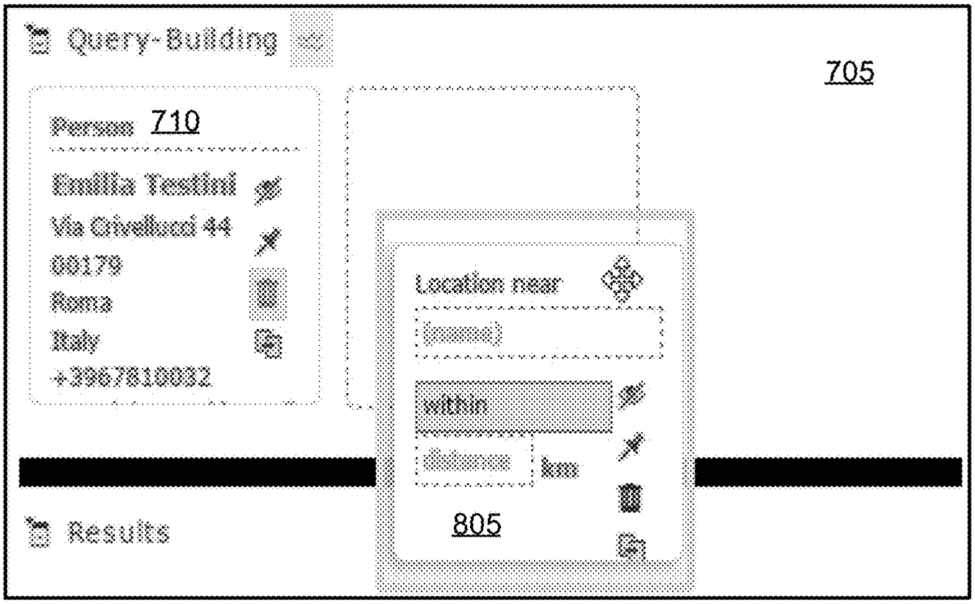

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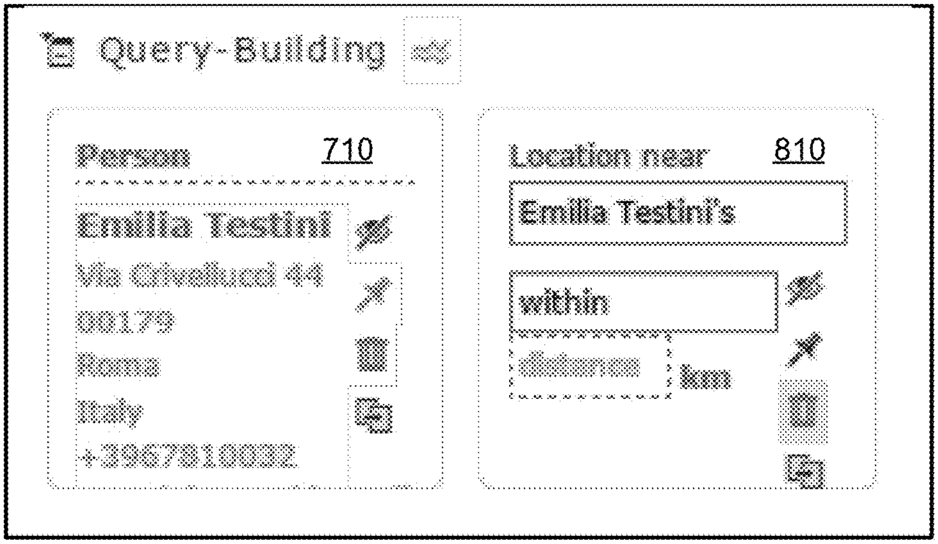
FIG. 8



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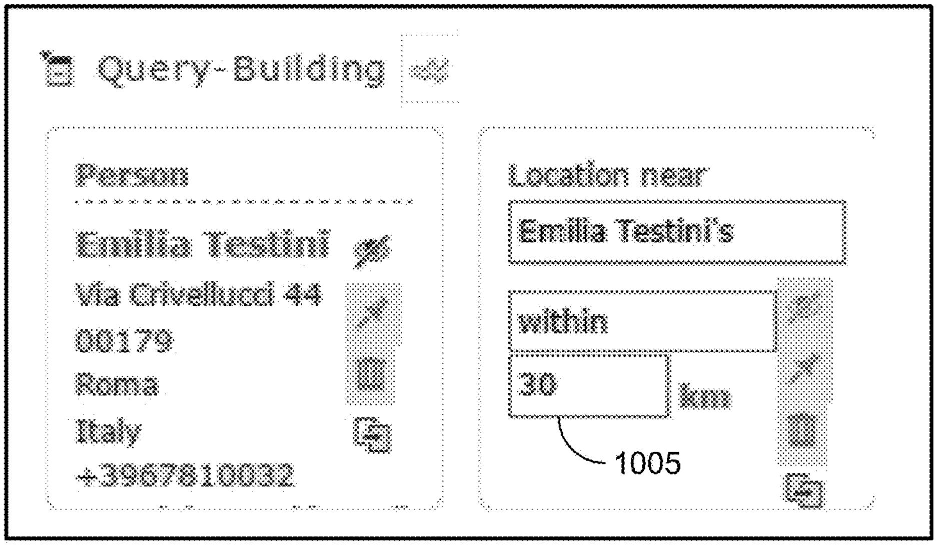
Emilia Testini's

within

distance

FIG. 9



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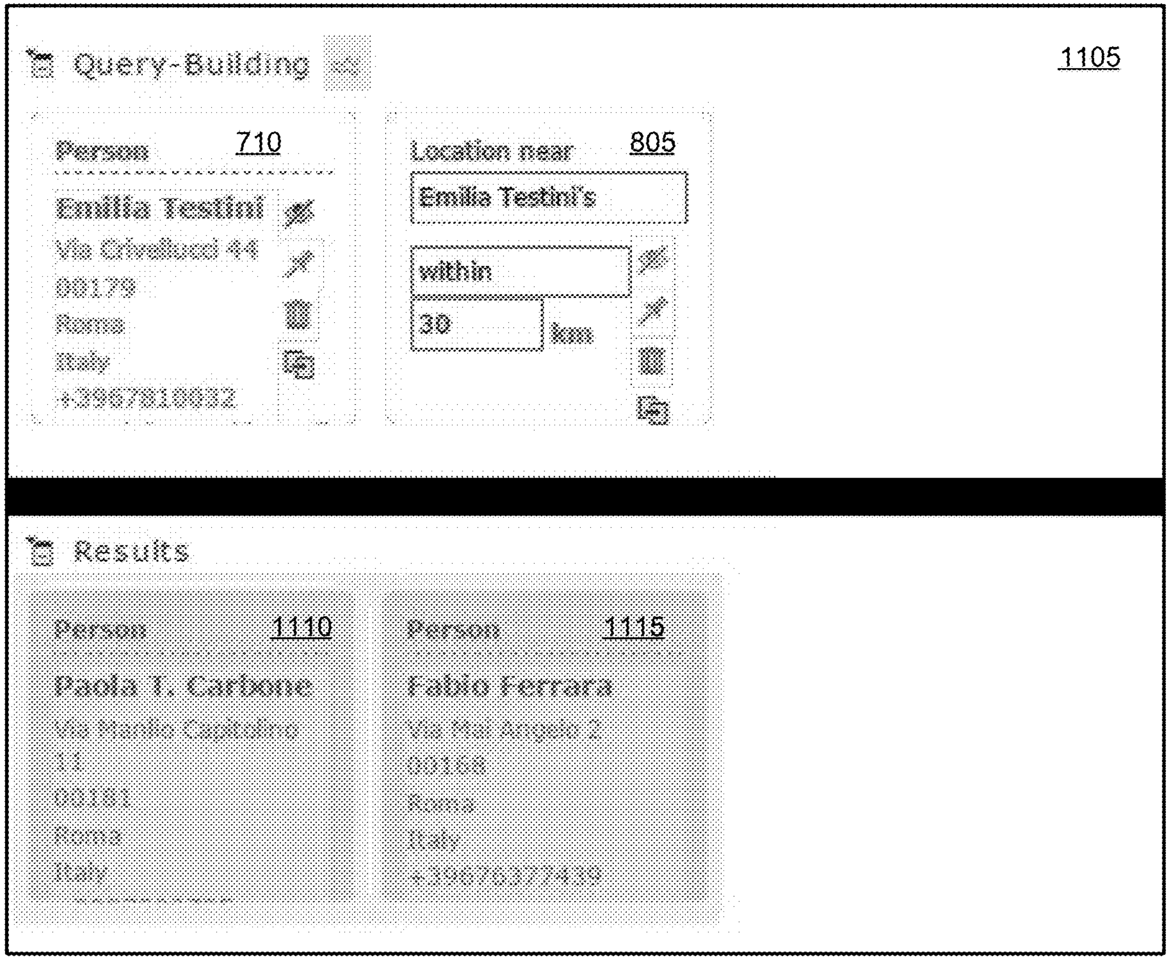
Emilia Testini's

within

30

FIG. 10



Query-Building

Person

Emilia Testini
Via Crivellucci 44
00179
Roma
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+3967810032

Location near

Emilia Testini's

within

30 km

Results

Person

Paola T. Carbone
Via Manlio Capitolino
11
00181
Roma
Italy

Person

Fabio Ferrara
Via Mal Angelo 2
00168
Roma
Italy
+39676377439

FIG. 11

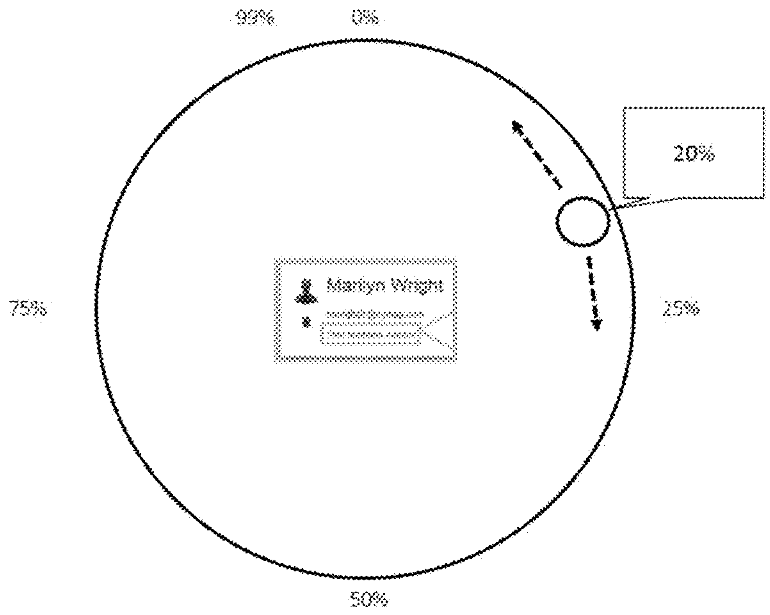

FIG. 12

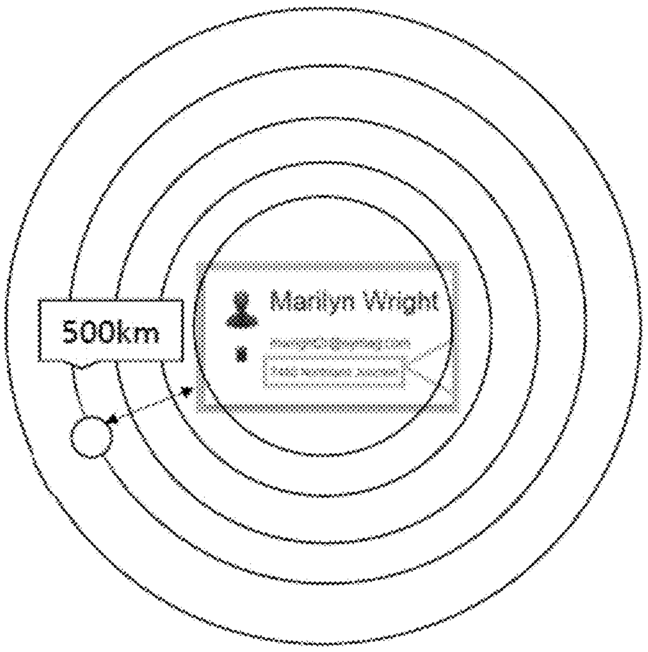

FIG. 13

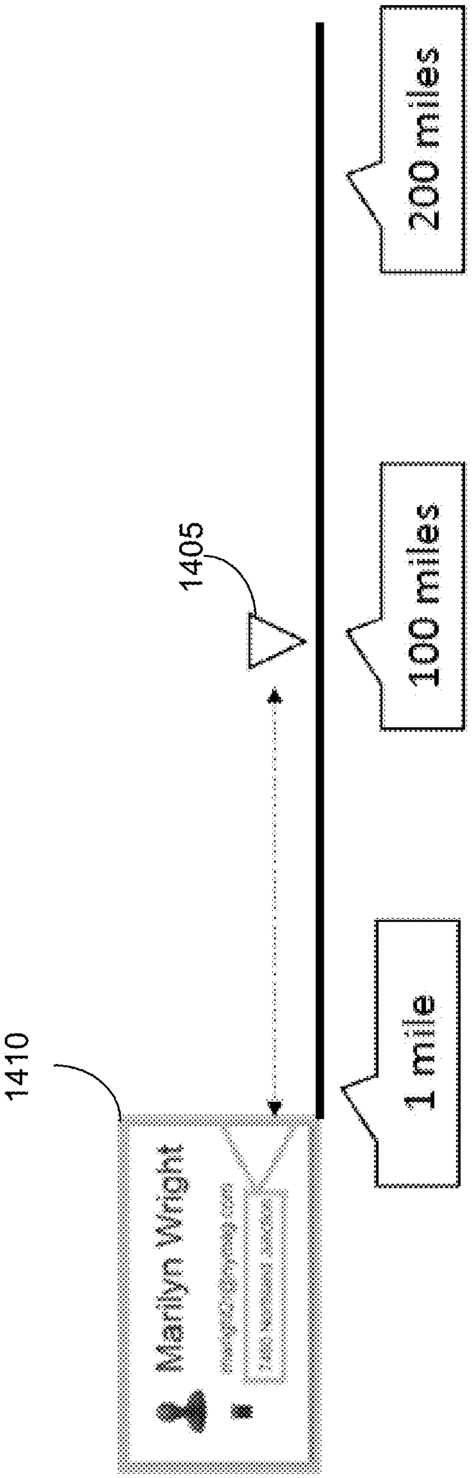

FIG. 14

DATA ITEM REFERENCE FOR A QUERY DEFINITION

BACKGROUND

A software application, device, or service may be designed and configured to provide search results in response to a query having search terms specified, at least in part, by a user thereof. In most instances, a user primarily expresses relations between the search terms using logical, database-oriented operators such as the logic operators AND, OR, etc. In some instances, the operator relating the search terms may be implicitly assumed by the application, device, or service performing the search. This may be the case when the logic operator is, most likely, the operator AND.

However, it remains the case that most conventional search applications, devices, and services rely on explicit, database-oriented operators that recite direct and literal connections between query search terms for the execution of a query based thereon. For example, a database including records of the personnel files of individuals working at a business entity might be searched for a particular address to determine whether an employee resides at a certain address. In executing a query including the address of interest as a search term, the database can be searched for the exact address attributes (e.g., street name and number, city, state, and postal code). In an instance a desired result is not achieved, further queries may be made by applying an additional filter (e.g., modified search term(s)) to the overall data set of the database.

In some contexts, there may exist a desire to more precisely define a complete query in an efficient manner.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an illustrative block diagram of a logical architecture for a system of an example embodiment;

FIG. **2** is an illustrative flow diagram of a process of an example embodiment;

FIG. **3** is an illustrative depiction of some aspects of a user interface of an example embodiment;

FIG. **4** is an illustrative depiction of some aspects of a user interface including aspects for building a query of an example embodiment;

FIG. **5** is an illustrative depiction of a process to build and execute a query of an example embodiment;

FIG. **6** is an illustrative flow diagram of a process of an example embodiment;

FIG. **7** is an illustrative depiction of a user interface including a query building area of an example embodiment;

FIG. **8** is an illustrative depiction of some aspect of a user interface including an example of a user manipulation of user interface elements of an example embodiment;

FIG. **9** is an illustrative depiction of some aspect of a user interface including an example of associating a second query item with a first query item of an example embodiment;

FIG. **10** is a further illustrative depiction of some aspect of a user interface including aspects of a user manipulation of user interface elements therein of an example embodiment;

FIG. **11** is an illustrative depiction of a user interface including results of a query executed user a query generated based on an example embodiment;

FIG. **12** is an illustrative depiction of a user interface including a UI control element of an example embodiment;

FIG. **13** is an illustrative depiction of another UI control element of an example embodiment; and

FIG. **14** is an illustrative depiction of yet another UI control element of an example embodiment.

DETAILED DESCRIPTION

The following description is provided to enable any person in the art to make and use the described embodiments. Various modifications, however, will remain readily apparent to those in the art.

FIG. **1** is an illustrative depiction of a logical architecture for a system that may benefit from and/or support some of the aspects of the present disclosure. In the context of system **100**, one or more software applications or services (i.e., "service") **105** may operate to provide search results to client devices **120**. Service **105** may be implemented, at least in part, as a cloud service with one or more aspects facilitated by one or more server having a processor to execute machine-readable instructions where the machine-readable instructions may be embodied in any form of tangible media, including those now known and those that become known in the future. Accordingly, service **105** is labeled a service/server.

Operation of the search capabilities and functionality of service **105** may be supported and facilitated by a backend system **110**. System **110** may include at least one processor, a local memory, a communication interface for communicating (e.g., receiving and transmitting) information to and from other devices, systems, and components, such as, for example, a database **115**. In some configurations, database **115** may comprise a repository including a data set of data items that may be searched during the execution of a query by service **105**.

Client devices **120** may communicate and interface with service **105**. Client devices **120** may include a portable communication device or system, including but not limited to, a "smartphone", a tablet computing device, a "smartwatch" or other wearable computing device having at least some form of a user interface, a laptop, and other devices compatible with the teachings herein. In some aspects, client devices provide a frontend of system **100**, a mechanism to transmit/receive information to/from a user. Client devices **120** may include a user interface as shown at **125**.

In some aspects herein, a number of features of a user interface (UI) will be discussed herein. It is noted however that at least some of the UI's shown herein (e.g., **125**) are examples of implementing the underlying concepts disclosed herein, that may extend beyond one or more specific implementations of a UI.

In some instances, a user may submit one or more search terms to service **105** via UI **125**, wherein service **105** in combination with backend system **110** can execute a query including the search terms, including searching data items stored in database **115**, and return search results to the user at UI **125**.

In accordance with some embodiments herein, some query items comprising a query herein may, simultaneously, be used both as a query item and as reference or anchor for defining a second query item. In accordance with these aspects, some embodiments herein include a first query item that is a content item of a data set (e.g., a data record) and a second query item that relates to another (e.g., the first) query item. The first query item may act as an anchor or a reference for the second query item. The second query item may refer to the first query item for values of one or more particular attributes. In some aspects, values of one or more attributes of the first query item (i.e., the data item of a data set to be queried) may be carried over, imported, or referenced by the second query item. In one way, a combination of the first query item and the second query item may be used to configure search term(s) that are more complete than conventional search terms that each refer to attributes of data items in a data set.

In some aspects, the data item of a data set herein will be referred to as a first query item. This first query item can be any data structure stored in and included in a data set that may be persisted by, for example, one or more database instances. The first query item includes one or more attributes or properties that indicate characteristics of the first query item. The first query item may also be referred to as an anchor or reference item.

Herein, a query item that refers to at least one particular attribute of another query item (as opposed to its own attributes associated with a data item in a data set) is referred to as a second query item. The second query item herein is defined as relating to at least one particular attribute of another query item. In some instances, a second query item herein may be referred to as an anchor query item since it refers to an anchor item.

In some embodiments, as will be illustrated below, a second query item may be at least partially pre-defined, wherein a user (or other entity) may specify some variable aspects of the second query item and other static aspects of the second query item are predetermined or fixed (e.g., by a service or application designer). A second query item herein may be at least partially predefined and may, in some or those instances, be referred to as a template. In some instances, the second query item may be specified "on-the-fly" by a user (or other entity) as they need a second query item.

As a brief example, a first query item may be a data record of a person including the person's name, address, and profession that is stored in a database. In accordance with the present disclosure, a second query item is predefined to refer to a location attribute of another query item (e.g., the first query item) and can accept values from the other query item (i.e., the first query item). In some embodiments, the second query item may also accept one or more values related to the attribute(s) referenced thereby from a user (or other entity). In this example, the second query item may refer to the address attribute of the first query item (as opposed to the any attribute of another data item in the data set to be searched). Further, the second query may be defined to illicit a range value for the related location referenced by the second query. Continuing with the same example, a use may be asked to provide a value for a range that the search result should be located within to the address of the first query item's address attribute (e.g., provide results within n miles or kilometers of the address of the first query item).

FIG. **2** is an illustrative depiction of a flow diagram for a process herein, according to some embodiments. At operation **205**, a representation of a first query item is received. The first query item belongs to a data set persisted by a data sore of some sort and embodiment and has at least one attribute.

At operation **210**, a second query item is received. The second query item may be at least partially pre-defined. The second query item is defined, whether pre-defined or not, as relating to another query item. In some aspects, the second query item need not refer to a specific other query item but rather to at least one attribute of another query item.

Process **200** continues to operation **215** where a computer or other device implemented processor associates the first query item with the second query item. In some instances, a user may provide an indication to the computing device that the first and second query items are to be associated with each other via selective user manipulations of UI elements of a UI.

At operation **220**, in response to the associating of the first query item and the second query item at operation **215**, a value for the at least one particular attribute of the second query item is retrieved from the first query item. In the example introduced earlier, the second query item is a "location" anchor query item that references the location attribute of the first query item (i.e., the address in the personal data record). Per operation **220**, the address in the data item represented by the first query item is retrieved from the data set. Continuing to operation **225**, the retrieved value for the address is saved. In some aspects, the saved value may be reported to a user and/or used in other processing operations.

FIGS. **3** and **4** provide illustrative depictions of a UI implementation that uses a visuo-spatial (i.e., visual and spatial) UI metaphor for generating and building a query, in accordance with some aspects herein. FIG. **3** includes aspects of a UI **300** having a first query item **3005** and a second query item **310**. Query item **305** is a data item having attributes of a name, telephone number, address, and an email address. The second query item **310** is an anchor query item defined as referencing a location of another query item, as shown by arrow **315**. The second query item also contains its own property/attribute, as illustrated by the radius attribute.

FIG. **4** illustrates the construction of a query herein that is accomplished by associating or combining the address of the first query item **305** that is referenced or pointed to by the second query item **310**. The database at **405** can then be searched/queried for locations within the "radius" specified by the second query item for the "address" of the first query item. For example, the database can be searched for other persons in the data set that have addresses within 5 miles of the address of John Smith, wherein the John Smith data item (personal data record) is specified by the first query item, the address attribute from the first query item is specified by the second query item, and the range value of 5 miles is also included in the second query item. In this manner, a specific, precise query can be constructed in an efficient manner.

FIG. **5** is an illustrative example of an overview of a process flow **500**, for some embodiments herein. At **505**, a first query item is received or otherwise selected or identified by a user, preferably in a graphical UI including a graphical representation of the first query item. In some embodiments, at **510**, selects or manipulates (e.g., drags) the first query item into a proximate location with the second query item. In some aspects, either the first query item and/or the second query item can be moved relative to the other.

At **510**, the system, service, or device associates the first query item and the second query item with each other in response to the user's (or other entity's) manipulation of the UI representations of the first and second query items relative to each other. Further, a determination is made at **510** whether there first query item has only one tuple of the type specified by the second query item. In the case there is just on such tuple, then process **500** proceeds to **515**. For example, the second query item specifies a date attribute of the first query item and the first query item includes only one date. Otherwise, process **500** proceeds to operation **520** where the multiple possible tuples of the first query item are determined and presented to the user (or other entity) at **520**.

For example, the second query item specifies a date attribute of the first query item and the first query item includes three dates. The user (or other entity) may be presented with all of the two possible dates and the user (or other entity) can specify which one(s) of the dates will be used for the query at **525**. The process continues to **515**.

At **515**, query search terms including the combination or association of the first and second query items as disclosed herein are generated. In an example for FIG. **5**, the search terms at **515** can include a search for dates around George's birthday, where the first query item is a data item including George's bibliographic information (e.g., name, address, date of birth, his hire date, his address, and email address) and the second query item is defined to refer to a date around (i.e., "near") a person's birthday as included in another query item. In the present example, the user selected George's birthday from a plurality of choices at **525** by determining the hire date could not logically be his birthday.

At **530**, the values from **515** are submitted to a search engine functionality and used to search the database for results that satisfy the search criteria. The search results can be presented to the user (or other entity) in a UI at **535**. In this example, other persons (e.g., employees) listed in the database having birthdays around George's can be returned in the results at **535**.

FIG. **6** is an illustrative flow diagram of a process including a user interface (UI) for facilitating some of the embodiments herein. FIG. **6**, in some aspects, relates to a UI for implementing some aspects of some processes herein. At operation **605**, a UI representation of a first query item is displayed. The first query item belongs to a data set persisted by a data sore of some sort and embodiment and has at least one attribute.

At operation **610**, a second query item is selected by a user (or other entity). The second query item may be at least partially pre-defined. The second query item is defined, whether pre-defined or not, as relating to another query item.

Process **200** advances to operation **615** where a computer or other processor implemented device associates the first query item with the second query item. In some instances, a user may provide an indication to the computing device that the first and second query items are to be associated with each other by selective user manipulations of UI elements of the UI. Different types of UI element manipulations can be leveraged, some examples of which will be disclosed below.

At operation **620**, in response to the associating of the first query item and the second query item at operation **615**, a value for the at least one particular attribute of the second query item is retrieved from the first query item. Continuing to operation **625**, the retrieved value for the address is saved. In some contexts and use-cases, the saved value may be reported to a user and/or used in other processing operations.

FIG. **7** is an illustrative depiction of one embodiment of a part of a UI **700**, in accordance with some aspects herein. UI **700** includes a query building area, generally shown at **705** and a first query item **710** location in or thereon. Query item **710** is a data record with attributes relating to a person.

FIG. **8** shows the query building area **705** of the UI, where a second query item **805** has been manipulated into close proximity to the first query item **710**. The relative closeness of the first and second query items relative to each other signals to the system supporting the UI that these two query items are to be combined or otherwise associated with each other.

FIG. **9** is a view of the UI subsequent to FIG. **8**. In FIG. **9**, the name of the data item of the first query item **710** is retrieved from the first query item by the second query item **810**, as discussed in the processes introduced above. FIG. **10** further illustrates a specification of a user-supplied value at **1005**. While the second query item is predefined to include a space-holder for the specific range, a user has to provide the particular value at **1005**.

FIG. **11** includes a results section of a UI, as shown at **1105**, in accordance with some examples. In particular, FIG. **11** includes data records that satisfy the search criteria including the search terms determined by the combination of the first and second query items (**710** and **805**). It is seen that the search results include the two files **1110** and **1115**.

FIGS. **12**, **13**, and **14** are different mechanisms for, in some example embodiments, specifying aspects of the attributes of a first query item and a second query item herein. FIG. **12** is a UI element comprising a "knob" **1205** that allows a user to indicate how remote result items should be from a reference item that is located at the center of the dial **1200**. The "knob" UI element **1205** can be manipulated by a user to vary the value represented thereby. In the present example of FIG. **12**, the maximum distance is 1000 miles and the knob **1205** can vary the percentage to be applied. For example, 20% Of 1000 miles is 200 miles.

FIG. **13** is a visual scale comprising concentric circles, where the circles represent distances. As such, the reference item **1305** is located in the center of the visual scale and the circles represent distances therefrom. A user selectively indicates how far one attribute can be at a maximum and still be considered valid.

FIG. **14** is an illustrative depiction of a linear scale, wherein a pointer mechanism **1405** is used to visually indicate a distance an object can be from a referenced item **1410**. It is noted that FIGS. **12-14** are examples of UI elements that can be used in some aspects herein, alone or in combination.

Aspects of the processes, systems, and services discussed hereinabove may be implemented through any tangible implementation of one or more of software, firmware, hardware, and combinations thereof.

Although embodiments have been described with respect to certain contexts, some embodiments may be associated with other types of devices, systems, and configurations, either in part or whole, without any loss of generality.

The embodiments described herein are solely for the purpose of illustration. Those in the art will recognize other embodiments which may be practiced with modifications and alterations.

What is claimed is:

1. A method of generating a query, the method comprising:

receiving a representation of a first query item, the first query item being a data structure belonging to a data set and having at least one attribute;

receiving a representation of a second query item, the second query item being an anchor query item type of data structure defined as relating to at least one particular attribute of another query item;

receiving an indication of a user selectively positioning one of a user interface (UI) element representation of the first query item and a user interface (UI) element representation of the second query item in proximate location to the representation of the other UI element representation of the first query item and the second query item in a visio-spatial user interface, the visio-spatial user interface including a display of both the UI element representation of the first query item and the UI element representation of the second query item;

associating, by a processor, the second query item with the first query item;

automatically retrieving, in response to the second query item being associated with the first query item, a value for the at least one particular attribute of the second query item defined as relating to another query item from the first query item;

generating, by the processor, query search terms including a combination of the retrieved value and the second query item; and

saving a record of the query search terms.

2. The method of claim **1**, wherein the data set comprises a database.

3. The method of claim **1**, wherein the first query item is a result of a query execution.

4. The method of claim **1**, wherein the at least one particular attribute is an attribute type.

5. The method of claim **1**, further comprising defining the first query item.

6. The method of claim **1**, wherein the second query item comprises a data structure having at least one predefined particular attribute.

7. The method of claim **1**, further comprising determining whether the at least one attribute of the first query item is compatible with the at least one particular attribute defined for the second query item.

8. The method of claim **7**, further comprising, in an instance there are multiple attributes of the first query item that are compatible with the at least one particular attribute defined for the second query item, determining each of the attributes of the first query item that is compatible with the at least one particular attribute defined for the second query item.

9. The method of claim **1**, wherein the first query item includes a plurality of data items belonging to the data set, each having at least one attribute.

10. A method of generating a query in a user interface, the method comprising:

displaying, in a visio-spatial user interface generated by a processor based device, a user interface (UI) element representation of a first query item, the first query item being a data structure belonging to a data set and having at least one attribute;

displaying, in the visio-spatial user interface, a UI element representation of a second query item, the second query item being an anchor query item type of data structure defined as relating to at least one particular attribute of another query item;

receiving an indication of a user selectively positioning one of the UI element representation of one of the first query item and the UI element representation of the second query item in proximate location to the UI element representation of the other of the first query item and the second query item in the visio-spatial user interface, the visio-spatial user interface including a display of both the UI element representation of the first query item and the UI element representation of the second query item;

associating, by a processor, the second query item with the first query item in response to the user selectively manipulating at least one of the UI element representation of the first query item and the UI element representation of the second query item within the visio-spatial user interface to indicate a relationship between the first query item and the second query item;

automatically retrieving, in response to the second query item being associated with the first query item, a value for the at least one particular attribute of the second query item defined as relating to another query item from the first query item;

generating, by the processor, query search terms including a combination of the retrieved value and the second query item; and

saving a record of the query search terms.

11. The method of claim **10**, wherein the data set comprises a database.

12. The method of claim **10**, wherein the first query item is a result of a query execution.

13. The method of claim **10**, wherein the at least one particular attribute is an attribute type.

14. The method of claim **10**, wherein the associating is performed in response to at least one of the following actions:

a user positioning the UI representation of the second query item in proximate location to the displayed UI element representation of the first query item in the user interface indicated by the user; and

a user selectively manipulating a UI element in the UI to specify a value for a strength of the relationship between the second query item and the first query item in the user interface.

15. The method of claim **10**, wherein the second query item comprises a data structure having at least one predefined particular attribute.

16. The method of claim **10**, further comprising determining whether the at least one attribute of the first query item is compatible with the at least one particular attribute defined for the second query item.

17. The method of claim **16**, further comprising, in an instance there are multiple attributes of the first query item that are compatible with the at least one particular attribute defined for the second query item, determining each of the attributes of the first query item that is compatible with the at least one particular attribute defined for the second query item.

18. The method of claim **10**, wherein the first query item includes a plurality of data items belonging to the data set, each having at least one attribute.

19. The method of claim **10** further comprising, subsequent to the associating, displaying the second query item in an expanded version of the first query item including a visual representation of the at least one particular attribute of the second query item.

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